

I. AMENDMENTS TO THE CLAIMS

Please cancel claims 17-37, and add claims 38-71 as directed below. (The claims have been amended in the manner suggested by the proposed amendments to 37 C.F.R. §1.121, as recommended by the Patent Office.)

1-16. (Previously Canceled)

17-37. (Canceled)

38. (New) A coil interface for coupling a neurovascular coil system to a magnetic resonance (MR) system; said neurovascular coil system having an array of coils including a birdcage coil, a spine coil, and at least one neck coil; said MR system being equipped with a predetermined number of receivers; said coil interface comprising:

- (a) a plurality of input ports for coupling to said coils of said neurovascular coil system;
- (b) a plurality of output ports for coupling to said predetermined number of receivers of said MR system; and
- (c) an interface circuit for enabling said input ports and said output ports to be selectively interconnected and thereby enable said neurovascular coil system to be selectively operated in (I) a neurovascular mode; (II) a high resolution brain mode; (III) a high speed brain mode; and (IV) a volume neck mode.

39. (New) The coil interface of claim 38 wherein said plurality of input ports includes:

- (a) a first input port for receiving an in-phase signal from said birdcage coil;
- (b) a second input port for receiving a quadrature signal from said birdcage coil;
- (c) a third input port for receiving a spine signal from said spine coil;

(d) a fourth input port for receiving a first neck signal from a first of said at least one neck coil; and

(e) a fifth input port for receiving a second neck signal from a second of said at least one neck coil; wherein in said neurovascular mode said interface circuit interconnects (i) said first and said second input ports to a first of said output ports; (ii) said third input port to a second of said output ports; (iii) said fourth input port to a third of said output ports; and (iv) said fifth input port to a fourth of said output ports.

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40. (New) The coil interface of claim 39 wherein said in-phase and said quadrature signals received by said first and said second input ports, respectively, are phase shifted relative to one another before being combined and applied to said first output port.

41. (New) The coil interface of claim 38 wherein said plurality of input ports includes:

(a) a first input port for receiving an in-phase signal from said birdcage coil; and

(b) a second input port for receiving a quadrature signal from said birdcage coil;

wherein in said high resolution brain mode said interface circuit interconnects (i) said first input port to one of said output ports and (ii) said second input port to an other of said output ports, thereby allowing said in-phase signal to be applied to said one output port and said quadrature signal to be applied to said other output port.

42. (New) The coil interface of claim 38 wherein said plurality of input ports includes:

(a) a first input port for receiving an in-phase signal from said birdcage coil; and

(b) a second input port for receiving a quadrature signal from said birdcage coil;

wherein in said high speed brain mode said interface circuit interconnects said first and said second input ports to a first of said output ports with said in-phase and said quadrature signals received by said first and said second input ports, respectively, being phase shifted relative to one another before being combined and applied to said first output port.

43. (New) The coil interface of claim 38 wherein said plurality of input ports includes:

- (a) a first input port for receiving a spine signal from said spine coil;
- (b) a second input port for receiving a first neck signal from said at least one neck coil; and
- (c) a third input port for receiving a second neck signal from said at least one neck coil;

wherein in said volume neck mode said interface circuit interconnects (i) said first input port to a first of said output ports thereby allowing said spine signal to be applied to said first output port, (ii) said second input port to a second of said output ports thereby allowing said first neck signal to be applied to said second output port, and (iii) said third input port to a third of said output ports thereby allowing said second neck signal to be applied to said third output port.

44. (New) The coil interface of claim 38 wherein said plurality of input ports includes:

- (a) a first input port for receiving a spine signal from said spine coil; and
- (b) a second input port for receiving a neck signal from said at least one neck coil;

wherein in said volume neck mode said interface circuit interconnects (i) said first input port to a first of said output ports thereby allowing said spine signal to be applied to said first output port, and (ii) said second input port to a second of said output ports thereby allowing said neck signal to be applied to said second output port.

45. (New) The coil interface of claim 38 wherein said plurality of input ports includes:

(a) a first input port for receiving an in-phase signal from said birdcage coil; and
(b) a second input port for receiving a quadrature signal from said birdcage coil;
wherein said interface circuit is switchable between interconnecting (i) said first and said second input ports to one of said output ports with said in-phase and said quadrature signals being phase shifted relative to one another, combined and applied to said one of said output ports; and (ii) said first and said second input ports, and applying said in-phase and said quadrature signals received respectively thereby, to a first and a second of said output ports, respectively.

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46. (New) The coil interface of claim 38 wherein a conductive path through said interface circuit between any one of said of input ports and any one of said output ports has an electrical length that is approximately equal to an integer multiple of half wavelengths.

47. (New) The coil interface of claim 38 wherein said interface circuit allows said neurovascular coil system to be switched remotely between said modes of operation.

48. (New) The coil interface of claim 47 wherein said interface circuit includes a combiner circuit for at least one of said coils for remotely switching said neurovascular coil system between said modes of operation, said combiner circuit comprising at least one remotely operable PIN diode and a 90 degree phase shifting circuit.

49. (New) The coil interface of claim 47 wherein said interface circuit includes at least one PIN diode operable from a console of said MR system for switching said neurovascular coil system between said modes of operation.

50. (New) The coil interface of claim 49 wherein said MR system determines which of said modes of operation of said neurovascular coil system to support by detecting via said receivers of said MR system a bias pattern of said at least one PIN diode.

51. (New) A method of operating a neurovascular coil system with a magnetic resonance (MR) system; said neurovascular coil system having an array of coils including a birdcage coil, a spine coil, and at least one neck coil; said MR system having a predetermined number of receivers; said method comprising the steps of:

- (a) providing a plurality of input ports for coupling to said coils of said neurovascular coil system;
- (b) providing a plurality of output ports for coupling to said predetermined number of receivers of said MR system; and
- (c) selectively interconnecting said input ports and said output ports and thereby enable said neurovascular coil system to be selectively operated in (I) a neurovascular mode; (II) a high resolution brain mode; (III) a high speed brain mode; and (IV) a volume neck mode.

52. (New) The method of claim 51 wherein said plurality of input ports includes:

- (a) a first input port for receiving an in-phase signal from said birdcage coil;
- (b) a second input port for receiving a quadrature signal from said birdcage coil;
- (c) a third input port for receiving a spine signal from said spine coil;
- (d) a fourth input port for receiving a first neck signal from a first of said at least one neck coil; and
- (e) a fifth input port for receiving a second neck signal from a second of said at least one neck coil; wherein in said neurovascular mode said interface circuit interconnects (i) said first and said

second input ports to a first of said output ports; (ii) said third input port to a second of said output ports; (iii) said fourth input port to a third of said output ports; and (iv) said fifth input port to a fourth of said output ports.

53. (New) The method of claim 52 wherein said in-phase and said quadrature signals received by said first and said second input ports, respectively, are phase shifted relative to one another before being combined and applied to said first output port.

54. (New) The method of claim 51 wherein said plurality of input ports includes:

- (a) a first input port for receiving an in-phase signal from said birdcage coil; and
- (b) a second input port for receiving a quadrature signal from said birdcage coil;

wherein in said high resolution brain mode said interface circuit interconnects (i) said first input port to one of said output ports and (ii) said second input port to an other of said output ports, thereby allowing said in-phase signal to be applied to said one output port and said quadrature signal to be applied to said other output port.

55. (New) The method of claim 51 wherein said plurality of input ports includes:

- (a) a first input port for receiving an in-phase signal from said birdcage coil; and
- (b) a second input port for receiving a quadrature signal from said birdcage coil;

wherein in said high speed brain mode said interface circuit interconnects said first and said second input ports to a first of said output ports with said in-phase and said quadrature signals received by said first and said second input ports, respectively, being phase shifted relative to one another before being combined and applied to said first output port.

56. (New) The method of claim 51 wherein said plurality of input ports includes:

- (a) a first input port for receiving a spine signal from said spine coil;
- (b) a second input port for receiving a first neck signal from said at least one neck coil; and
- (c) a third input port for receiving a second neck signal from said at least one neck coil;

wherein in said volume neck mode said interface circuit interconnects (i) said first input port to a first of said output ports thereby allowing said spine signal to be applied to said first output port, (ii) said second input port to a second of said output ports thereby allowing said first neck signal to be applied to said second output port, and (iii) said third input port to a third of said output ports thereby allowing said second neck signal to be applied to said third output port.

57. (New) The method of claim 51 wherein said plurality of input ports includes:

- (a) a first input port for receiving a spine signal from said spine coil; and
- (b) a second input port for receiving a neck signal from said at least one neck coil;

wherein in said volume neck mode said interface circuit interconnects (i) said first input port to a first of said output ports thereby allowing said spine signal to be applied to said first output port, and (ii) said second input port to a second of said output ports thereby allowing said neck signal to be applied to said second output port.

58. (New) The method of claim 51 wherein said plurality of input ports includes:

- (a) a first input port for receiving an in-phase signal from said birdcage coil; and
- (b) a second input port for receiving a quadrature signal from said birdcage coil;

wherein said interface circuit is switchable between interconnecting (i) said first and said second input ports to one of said output ports with said in-phase and said quadrature signals being phase shifted relative to one another, combined and applied to said one of said output ports; and (ii)

said first and said second input ports, and applying said in-phase and said quadrature signals received respectively thereby, to a first and a second of said output ports, respectively.

59. (New) The method of claim 51 further comprising the step of effectively disabling said coils that are unused in accordance with a particular one of said modes of operation currently selected.

60. (New) The method of claim 51 wherein the step of selectively interconnecting said input ports and said output ports is accomplished by changing a state of at least one PIN diode so as to switch said neurovascular coil system between said modes of operation.

61. (New) The method of claim 60 wherein said MR system determines which of said modes of operation of said neurovascular coil system to support by detecting via said receivers of said MR system a bias pattern of said at least one PIN diode.

62. (New) The method of claim 51 wherein the step of selectively interconnecting said input ports and said output ports is carried out by using at least one combiner circuit for remotely switching said neurovascular coil system between said modes of operation, said combiner circuit comprising at least one remotely operable PIN diode and a 90 degree phase shifting circuit.

63. (New) The method of claim 51 wherein a conductive path between any one of said input ports and any one of said output ports has an electrical length that is approximately equal to an integer multiple of half wavelengths.

64. (New) A neurovascular coil system for coupling to a magnetic resonance (MR) system, said MR system being equipped with a predetermined number of receivers, said neurovascular coil system comprising:

- (a) an array of coils including a birdcage coil, at least one spine coil, and at least one neck coil;
- (b) a plurality of input ports with said birdcage coil connected to at least one of said input ports, said at least one spine coil connected to one of said input ports, and said at least one neck coil connected to at least one of said input ports;
- (c) a plurality of output ports for coupling to said predetermined number of receivers of said MR system; and
- (d) an interface circuit for enabling said input ports and said output ports to be selectively interconnected and thereby enable said neurovascular coil system to be selectively operated in (I) a neurovascular mode; (II) a high resolution brain mode; (III) a high speed brain mode; and (IV) a volume neck mode.

65. (New) The neurovascular coil system of claim 64 wherein in said neurovascular mode:

- (a) said birdcage coil by a first and a second of said input ports is interconnected to a first of said output ports, thereby enabling an in-phase signal and a quadrature signal from said birdcage coil to be applied through said first output port to a first of said receivers of said MR system;
- (b) said at least one spine coil by a third said input ports is interconnected to a second of said output ports, thereby enabling a spine signal from said at least one spine coil to be applied through said second output port to a second of said receivers of said MR system; and
- (c) said at least one neck coil by a fourth and a fifth of said input ports is interconnected to a third and a fourth, respectively, of said output ports, thereby enabling a first neck signal from a first of

said at least one neck coil and a second neck signal from a second of said at least one neck coil to be applied through said third and said fourth output ports, respectively, to a third and a fourth of said receivers, respectively, of said MR system.

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66. (New) The neurovascular coil system of claim 65 wherein said in-phase and said quadrature signals of said birdcage coil received by said first and said second input ports, respectively, are within said interface circuit phase shifted relative to one another before being combined and applied to said first output port.

67. (New) The neurovascular coil system of claim 64 wherein in said high resolution brain mode said birdcage coil by a first and a second of said input ports is interconnected to a first and a second, respectively, of said output ports, thereby enabling an in-phase signal and a quadrature signal from said birdcage coil to be applied through said first and said second output ports to a first and a second, respectively, of said receivers of said MR system.

68. (New) The neurovascular coil system of claim 64 wherein in said high speed brain mode said birdcage coil by a first and a second of said input ports is interconnected to a first of said output ports, with an in-phase signal and a quadrature signal of said birdcage coil received by said first and said second input ports, respectively, being phase shifted relative to one another before being combined and applied to said first output port by said interface circuit.

69. (New) The neurovascular coil system of claim 64 wherein in said volume neck mode:

(a) said at least one spine coil by a first of said input ports is interconnected to a first of said output ports, thereby enabling a spine signal from said at least one spine coil to be applied through said first output port to a first of said receivers of said MR system; and

(b) said at least one neck coil by a second and a third of said input ports is interconnected to a second and a third, respectively, of said output ports, thereby enabling a first neck signal from a first of said at least one neck coil and a second neck signal from a second of said at least one neck coil to be applied through said second and said third output ports, respectively, to a second and a third of said receivers, respectively, of said MR system.

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70. (New) The neurovascular coil system of claim 65 wherein in said volume neck mode:

(a) said at least one spine coil by a first of said input ports is interconnected to a first of said output ports, thereby enabling a spine signal from said at least one spine coil to be applied through said first output port to a first of said receivers of said MR system; and

(b) said at least one neck coil by a second of said input ports is interconnected to a second of said output ports, thereby allowing a neck signal from said at least one neck coil to be applied to said second output port.

71. (New) A magnetic resonance (MR) system comprising:

(a) a predetermined number of receivers; and

(b) a neurovascular coil system operably connectable to said MR system, said neurovascular coil system including:

(i) an array of coils including a birdcage coil, at least one spine coil, and at least one neck coil;

(ii) a plurality of input ports with said birdcage coil connected to at least one of said input ports, said at least one spine coil connected to one of said input ports, and said at least one neck coil connected to at least one of said input ports;

(iii) a plurality of output ports for coupling to said predetermined number receivers;
and

(iv) an interface circuit for enabling said input ports and said output ports to be selectively interconnected;

thereby enabling said neurovascular coil system to be selectively operated via said MR system in (A) a neurovascular mode; (B) a high resolution brain mode; (C) a high speed brain mode; and (D) a volume neck mode.

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